SIEMENS

syngo®*.four*Sight™ Workplace

DICOM Conformance Statement

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Table of Contents

Table of Contents **2**

1 Introduction **5**

1.1 Purpose 5

1.2 Scope and Field 5

1.3 Definitions, Terms and Abbreviations 6

1.4 References 7

2 Implementation Model Verification **8**

2.1 Application Data Flow Diagram 8

2.1.1 Verification SCU 8

2.2 Functional Definitions of Applications 8

2.2.1 Store SCU 8

2.2.2 Store SCP 9

2.2.3 Sequencing of Real-World Activities 9

3 Application Entity Specification Verification **10**

3.1 Verification AE Specification 10

3.1.1 Association Establishment Policies 10

3.1.1.1 General 10

3.1.1.2 Number of Associations 10

3.1.1.3 Asynchronous Nature 10

3.1.1.4 Implementation Identifying Information 10

3.1.2 Association Initiation Policy 10

3.1.2.1 Associated Real-World Activity - Verification 11

3.1.2.1.1 Associated Real-World Activity – Request Verification “verification” 11

3.1.2.1.2 Proposed Presentation Contexts 11

3.1.2.1.3 SOP Specific Conformance – Verification SCU 11

4 Implementation Model Storage **12**

4.1 Application Data Flow Diagram 12

4.2 Functional Definitions of Application Entities 12

4.3 Sequencing of Real-World Activities 12

5 Application Entity Specification Storage **13**

5.1 Storage AEs Specification 13
5.1.1 Association Establishment Policies 13
5.1.1.1 General 13
5.1.1.2 Number of Associations 13
5.1.1.3 Asynchronous Nature 13
5.1.1.4 Implementation Identifying Information 13
5.1.2 Association Initiation Policy 14
5.1.2.1 Associated Real-World Activity – Send Image Objects to a Network Destination 14
5.1.2.2 Proposed Presentation Context – Send Images 14
5.1.2.3 SOP Specific Conformance to Storage SOP Classes 19
5.1.2.3.1 Optional Attributes 19
5.1.2.3.2 Specialized Information Object Definitions 19
6 Implementation Model Query/Retrieve 21
6.1 Application Data Flow Diagram 21
6.2 Functional Definitions of Application Entities 21
6.3 Sequencing of Real-World Activities 22
7 Application Entity Specification Query/Retrieve 23
7.1 Query/Retrieve Service AEs Specification 23
7.1.1 Association Establishment Policies 23
7.1.1.1 General 23
7.1.1.2 Number of Associations 23
7.1.1.3 Asynchronous Nature 24
7.1.1.4 Implementation Identifying Information 24
7.1.2 Association Initiation Policy 24
7.1.2.1 Real World Activity – Find SCU 24
7.1.2.1.1 Associated Real-World Activity – Find SCU “Search” 24
7.1.2.1.2 Proposed Presentation Contexts – Find SCU 24
7.1.2.1.3 Conformance Statement – Find SCU 25
7.1.2.2 Real-World Activity – Move SCU 30
7.1.2.2.1 Associated Real-World Activity – Move SCU “Import” 30
7.1.2.2.2 Proposed Presentation Contexts – Move SCU “Import” 30
7.1.2.2.3 SOP Specific Conformance Statement – Move SCU “import” 30
8 Communication Profiles 32
8.1 Supported Communication Stacks 32

8.1.1 TCP/IP Stack 32
8.1.1.1 API 32
8.1.1.2 Physical Media Support 32
9 Information Object Implementation 33
9.1 US Image Storage IOD 33
9.1.1 US Image Storage IOD Modules 33
9.1.2 US Image Storage Module Descriptions 34
9.1.2.1 Patient Module 34
9.1.2.2 General Study Module 34
9.1.2.3 General Series Module 34
9.1.2.4 General Equipment Module 34
9.1.2.5 General Image Module 35
9.1.2.6 Image Pixel Module 35
9.1.2.7 SOP Common Module 35
9.1.2.8 US Region Calibration Module Attributes 35
List of Figures 37
List of Tables 38

1 Introduction

This DICOM conformance statement specifies the behavior and functionality of the *syngo.four*Sight Workplace application. This software provides the following capabilities:

- Reads and displays compressed and uncompressed monochrome and color DICOM images of Siemens Ultrasound modality.
- Sends and receives DICOM objects via the DICOM Storage Service Class using conventional DICOM communication is supported.

1.1 Purpose

This document is intended for hospital staff, health system integrators, software designers or developers. It is assumed that the reader has a working understanding of DICOM.

1.2 Scope and Field

This DICOM Conformance Statement documents the conformance of the *syngo.four*Sight Workplace application software with the Digital Imaging and Communications in Medicine (DICOM) standard. This document is essential in order to evaluate whether or not another DICOM compliant device can communicate with this software product. This statement is conformant with the recommended format as described in PS 3.2 of the DICOM standard.

1.3 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

ASCII	American Standard Code for Information Interchange
AE	Application Entity
ANSI	American National Standards Institute
CR	Computed Radiography
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
ECR	European Congress of Radiology
GSPS	Grayscale Softcopy Presentation State
HIMSS	Healthcare Information and Management Systems Society
IE	Information Entity
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
ISO	International Standards Organization
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
RSNA	Radiological Society of North America
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
SR	Structured Reporting
TCP/IP	Transmission Control Protocol / Internet Protocol
TLS	Transport Layer Security
UID	Unique Identifier
VM	Value Multiplicity
VR	Value Representation

1.4 References

[1] [DICOM] Digital Imaging and Communications in Medicine, NEMA PS 3.1-3.15, 2001

2 Implementation Model Verification

The *syngo*.fourSight Workplace application requests Verification to verify the ability of a foreign DICOM application on a remote node to respond to DICOM messages.

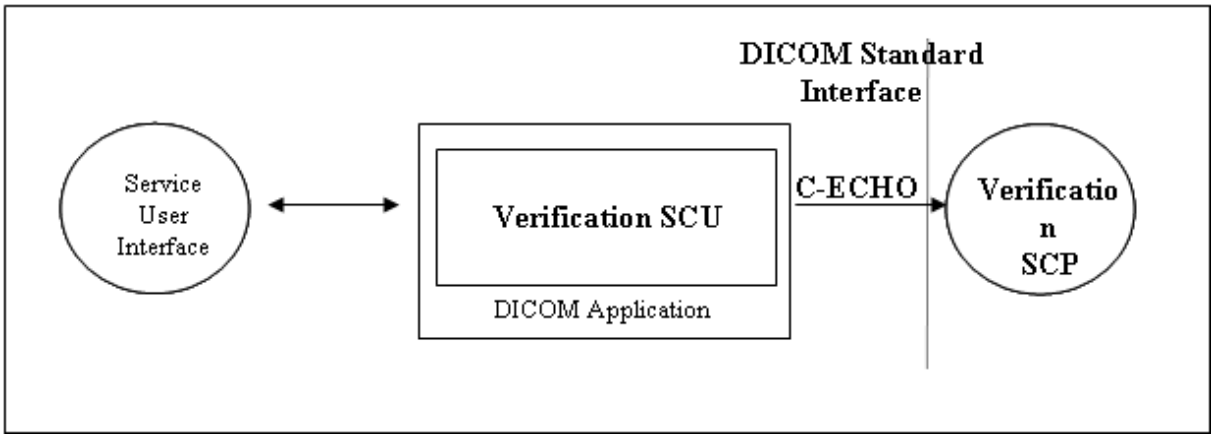
Responding to Verification requests from remote nodes is handled by the Storage SCP application.

2.1 Application Data Flow Diagram

2.1.1 Verification SCU

The *syngo.four*Sight WorkPlace DICOM network implementation acts as SCU for the C-ECHO DICOM network service. The product target Operating System is Microsoft Windows XP Professional SP2 (32 bit).

Figure 1: Application Data Flow Diagram - Verification SCU



2.2 Functional Definitions of Applications

2.2.1 Store SCU

Store SCU is an application entity that implements the DICOM Storage Service Class as SCU. Store SCU is activated by *syngo.four*Sight Workplace whenever the user requests transmission of one or more objects from the local database to a remote node. For each transmission request a separate Store SCU is sparked. A transmission request may consist of the transmission of a single image, or a complete study. All objects comprising one transmission request are transmitted over one association. When transmission is finished, the

association is released and Store SCU terminates. If the transmission of an object fails because the peer Store SCP sends back an error code or no valid presentation context for the transmission of the object is available, the association is aborted and Store SCU also terminates.

2.2.2 Store SCP

Store SCP is an application entity that implements the DICOM Storage Class and the Verification Service Class as SCP. Store SCP is started as a Windows NT service. When Store SCP is terminated, it stops to accept any further associations and terminates as soon as all currently active associations are closed. Store SCP spawns a new thread for each incoming DICOM association request. The association remains open until the remote application entity closes the association or until an error condition occurs that leads to an association abort.

2.2.3 Sequencing of Real-World Activities

Not Applicable.

3 Application Entity Specification Verification

3.1 Verification AE Specification

3.1.1 Association Establishment Policies

3.1.1.1 General

The *syngo.four*Sight Workplace application attempts to open an association for verification request whenever the “Echo” function is activated during network configuration of a remote DICOM application.

3.1.1.2 Number of Associations

The *syngo.four*Sight Workplace application initiates one association at a time to request verification.

3.1.1.3 Asynchronous Nature

The *syngo.four*Sight Workplace DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

3.1.1.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

3.1.2 Association Initiation Policy

The *syngo.*fourSight Workplace application attempts to initiate a new association for

- DIMSE C-ECHO

service operations.

3.1.2.1 Associated Real-World Activity - Verification

3.1.2.1.1 Associated Real-World Activity – Request Verification "verification"

The associated Real-World activity is a C-ECHO request initiated by Service and Configuration SW environment whenever a "verification" is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application contains a status other than "Success" this will be indicated in the service environment and the association is closed.

3.1.2.1.2 Proposed Presentation Contexts

The *syngo.four*Sight Workplace application will propose Presentation Contexts as shown in the following table:

Presentation Context Table – Verification SCU					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

3.1.2.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definitions of the Verification SCU in accordance to the DICOM Standard.

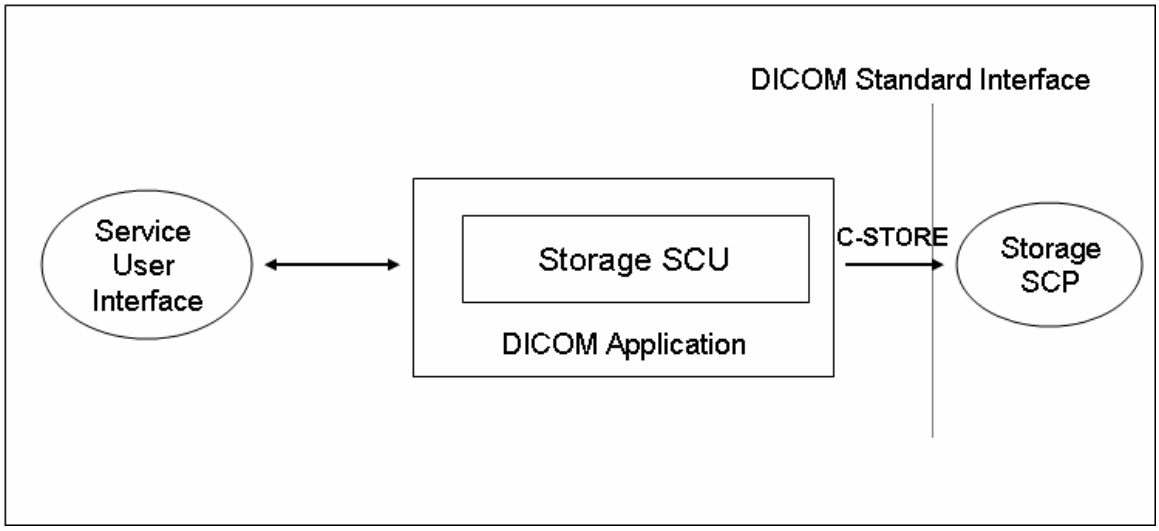
4 Implementation Model Storage

The *syngo.four*Sight Workplace Application Entity both originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities and accepts association requests for Storage from Remote Application Entities.

4.1 Application Data Flow Diagram

The *syngo.four*Sight Workplace DICOM network implementation acts as SCU for the C-STORE DICOM network. The product target Operating System is Microsoft Windows XP Professional SP2 (32 bit).

Figure 2: Application Data Flow Diagram - Storage SCU



4.2 Functional Definitions of Application Entities

The Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

4.3 Sequencing of Real-World Activities

Not Applicable.

5 Application Entity Specification Storage

5.1 Storage AEs Specification

The *syngo.four*Sight Workplace Storage service class user applications use one AE when initiating associations to remote DICOM nodes. It provides Standard Conformance to the following DICOM 2009 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Secondary **C**apture Image Storage	1.2.840.10008.5.1.4.1.1.7
Ultra**S**ound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultra**S**ound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-Frame Image (retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Image (retired)	1.2.840.10008.5.1.4.1.1.6

5.1.1 Association Establishment Policies

5.1.1.1 General

The existence of a job queue entry with network destination or an internal trigger from processing a retrieve request will activate the DICOM Storage Application. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the transfer is started.

The default PDU size used will be 28 KB.

5.1.1.2 Number of Associations

The *syngo.four*Sight Workplace application initiates several associations at a time for storage.

5.1.1.3 Asynchronous Nature

The *syngo.four*Sight Workplace application does not support asynchronous communication (multiple outstanding transactions over a single association).

5.1.1.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

5.1.2 Association Initiation Policy

The *syngo.four*Sight Workplace application attempts to initiate a new association for

- DIMSE C_ECHO
- DIMSE C-STORE

service operations.

5.1.2.1 Associated Real-World Activity – Send Image Objects to a Network Destination

The associated Real-World activity is a C-STORE request initiated by an internal daemon process triggered by a job with network destination or the processing of an external C-MOVE retrieve request. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote Application contains a status other than “Success” or “Warning”, the association is aborted.

5.1.2.2 Proposed Presentation Context – Send Images

The *syngo.four*Sight Workplace application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Secondary **C**apture Image	1.2.840.10008.5.1.4.1.1.7	JPEG Lossy Baseline (Process 1) ***1**	1.2.840.10008.1.2.4.50	SCU/SCP	None
		JPEG Lossy Extended ***1** (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57		
		JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
		JPEG-LS Lossless	1.2.840.10008.1.2.4.80		
		JPEG-LS Lossy	1.2.840.10008.1.2.4.81		
		JPEG2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG2000 (Lossless or Lossy)	1.2.840.10008.1.2.4.91		
		JPEG 2000 Part 2 (Lossless Only)	1.2.840.10008.1.2.4.92		
		JPEG 2000 Part 2 (Lossless or Lossy)	1.2.840.10008.1.2.4.93		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Ultra-**S**ound Multi-Frame Image	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossy Baseline (Process 1) ***1**	1.2.840.10008.1.2.4.50	SCU/SCP	None
		JPEG Lossy Extended ***1** (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57		
		JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
		JPEG-LS Lossless	1.2.840.10008.1.2.4.80		
		JPEG-LS Lossy	1.2.840.10008.1.2.4.81		
		JPEG2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG2000 (Lossless or Lossy)	1.2.840.10008.1.2.4.91		
		JPEG 2000 Part 2 (Lossless Only)	1.2.840.10008.1.2.4.92		
		JPEG 2000 Part 2 (Lossless or Lossy)	1.2.840.10008.1.2.4.93		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Ultra-**S**ound Multi-Frame Image (Retired)	1.2.840.10008.5.1.4.1.1.3	JPEG Lossy Baseline (Process 1) ***1**	1.2.840.10008.1.2.4.50	SCU/SCP	None
		JPEG Lossy Extended ***1** (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57		
		JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
		JPEG-LS Lossless	1.2.840.10008.1.2.4.80		
		JPEG-LS Lossy	1.2.840.10008.1.2.4.81		
		JPEG2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG2000 (Lossless or Lossy)	1.2.840.10008.1.2.4.91		
		JPEG 2000 Part 2 (Lossless Only)	1.2.840.10008.1.2.4.92		
		JPEG 2000 Part 2 (Lossless or Lossy)	1.2.840.10008.1.2.4.93		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Ultra-**S**ound Image	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossy Baseline (Process 1) ***1**	1.2.840.10008.1.2.4.50	SCU/SCP	None
		JPEG Lossy Extended ***1** (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57		
		JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
		JPEG-LS Lossless	1.2.840.10008.1.2.4.80		
		JPEG-LS Lossy	1.2.840.10008.1.2.4.81		
		JPEG2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG2000 (Lossless or Lossy)	1.2.840.10008.1.2.4.91		
		JPEG 2000 Part 2 (Lossless Only)	1.2.840.10008.1.2.4.92		
		JPEG 2000 Part 2 (Lossless or Lossy)	1.2.840.10008.1.2.4.93		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Name	UID	Name List	UID List	Role	Ext. Neg.
Ultra-**S**ound Image (Retired)	1.2.840.10008.5.1.4.1.1.6	JPEG Lossy Baseline (Process 1) ***1**	1.2.840.10008.1.2.4.50	SCU/SCP	None
		JPEG Lossy Extended ***1** (Process 2 & 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57		
		JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
		JPEG-LS Lossless	1.2.840.10008.1.2.4.80		
		JPEG-LS Lossy	1.2.840.10008.1.2.4.81		
		JPEG2000 (Lossless Only)	1.2.840.10008.1.2.4.90		
		JPEG2000 (Lossless or Lossy)	1.2.840.10008.1.2.4.91		
		JPEG 2000 Part 2 (Lossless Only)	1.2.840.10008.1.2.4.92		
		JPEG 2000 Part 2 (Lossless or Lossy)	1.2.840.10008.1.2.4.93		
		RLE Lossless	1.2.840.10008.1.2.5		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Implicit VR Little Endian	1.2.840.10008.1.2		

***1:** The Transfer Syntax used is strongly influenced by the fact of "how was the accepted Transfer Syntax at the time when the Instance was received". e.g. the Instances received with JPEG Lossy Transfer Syntaxes will not be converted and can only be sent out with the same Transfer Syntax.

5.1.2.3 SOP Specific Conformance to Storage SOP Classes

The *syngo.four*Sight Workplace application will create SC IOD type images when performing a "Save as…" operation that creates Derived Images. The SC IOD will be a Standard Extended SC Storage SOP Class.

5.1.2.3.1 Optional Attributes

- Data Dictionary of DICOM Type 2 and 3 IOD Attributes

Please see the related Image Object definition tables in the Annex for a list of all DICOM IOD attributes of type 2 and 3, which are encoded by the *syngo.four*Sight Workplace application.

5.1.2.3.2 Specialized Information Object Definitions

The DICOM images created by *syngo.four*Sight Workplace application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements, which have to be discarded by a DICOM system when modifying the image.

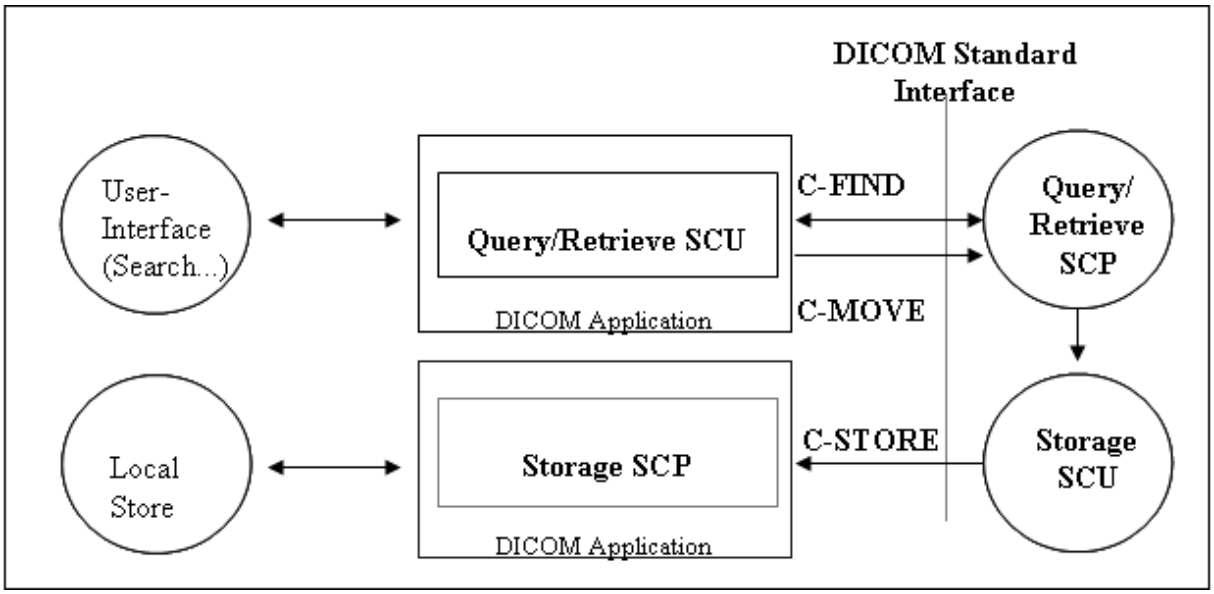
6 Implementation Model Query/Retrieve

The query/retrieve service class defines an application-level class of services which facilitates the management of images and patient data against the well-defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node or to request a remote DICOM AE to initiate a transfer of images to another DICOM AE. The *syngo.four*Sight Workplace application supports the query/retrieve services to act as SCU.

6.1 Application Data Flow Diagram

The *syngo.four*Sight Workplace network implementation acts as SCU for the query/retrieve network service. The product target Operating System is Microsoft Windows XP Professional SP2 (32 bit).

Figure 3: syngo.fourSight Workplace Application Data Flow Diagram - Query/Retrieve SCU



6.2 Functional Definitions of Application Entities

The *syngo.four*Sight Workplace query/retrieve SCU requests the remote query/retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the *syngo.four*Sight Workplace user interface. Depending on user action (Import) the *syngo.four*Sight Workplace sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the *syngo.four*Sight Workplace Storage SCP.

6.3 Sequencing of Real-World Activities

- Retrieve of images is only possible if connectivity details of *syngo.four*Sight Workplace exists at Query/Retrieve Service Class Provider.
- Retrieve of images is only possible if results from a previous “Search…” operation exists and those entries can be selected for “Import”.

7 Application Entity Specification Query/Retrieve

7.1 Query/Retrieve Service AEs Specification

The Query/Retrieve SCU requests that the remote SCP performs a match of all keys specified in the request, against the information in its database and the identified images will be moved over a different (C-MOVE) storage association.

The Query/Retrieve SCP responds to queries based on the records based on its database and images will be sent to the requesting SCU or to a different storage destination.

The *syngo* RT Viewer application provides Standard Conformance to the following DICOM 2009 SOP Classes as SCU:

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2

7.1.1 Association Establishment Policies

7.1.1.1 General

With the “Search” function the query data are input and the DICOM query/retrieve application is started. A query request will be sent out to one remote node that can be selected from a list of configured Query Providers and the response data will be displayed for the user. Upon request (Import), the retrieval of selected items is initiated.

7.1.1.2 Number of Associations

The *syngo.four*Sight Workplace application initiates one association at a time for query/retrieve.

7.1.1.3 Asynchronous Nature

The *syngo.four*Sight Workplace does not support asynchronous communication (multiple outstanding transactions over a single association).

7.1.1.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.7230010.3.0.3.5.4
Implementation Version Name	OFFIS_DCMTK_354

7.1.2 Association Initiation Policy

The query user interface will request the query-data from user and triggers one C-FIND request to the selected remote node. The response data will be displayed in the query UI for further data navigation.

When requesting Import of related items the browser requests the retrieve application to send a C-MOVE request to the related remote node. Images will then be received by the Storage SCP.

7.1.2.1 Real World Activity – Find SCU

7.1.2.1.1 Associated Real-World Activity – Find SCU "Search"

The associated Real-World activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. When data transfer is finished the association is closed.

7.1.2.1.2 Proposed Presentation Contexts – Find SCU

The *syngo.four*Sight Workplace application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

7.1.2.1.3 Conformance Statement – Find SCU

The *syngo.four*Sight Workplace application Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is not supported by the Query SCU. Nevertheless, retrieval of individual Objects is possible. The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

The following table shows the matching and return keys that are used in forming the query and it should be read as follows.

- Attribute Name – Attributes supported for returned C-FIND Responses
- Tag – Appropriate DICOM tag for this attribute
- Type – Usage type
  - ❖ "R" = Required
  - ❖ "U" = Unique
  - ❖ "O" = Optional
- Matching – The types of Matching supported by the C-FIND SCU.
- User Input – user input value
- Return Value Display – return value

Attribute name	Tag	Type	Matching	User Input	Return Value Display
Study Level					
Patient Name	(0010,0010)	R	Wildcard	enter value	yes
Patient ID	(0010,0020)	R	Wildcard	enter value	yes
Patient's Birth date	(0010,0030)	O	universal (Null)	enter value	yes
Patient's Sex	(0010,0040)	O	universal (Null)	-	yes
Study Instance UID	(0020,000D)	U	universal (Null)		no
Study ID	(0020,0010)	R	universal (Null)	-	yes
Study Date	(0008,0020)	R	universal (Null)	-	yes
Study Time	(0008,0030)	R	universal (Null)	-	yes
Accession Number	(0008,0050)	R	universal (Null)	-	yes
Study	(0008,1030)	O	universal	-	yes

Attribute name	Tag	Type	Matching	User Input	Return Value Display
Description			(Null)		
Referring Physician's Name	(0008,0090)	O	universal (Null)	-	yes
Name of Physician Reading Study	(0008,1060)	O	universal (Null)	-	yes
Modalities in Study	(0008,0061)	O	universal (Null)	-	yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	no
Retrieve AE Title	(0008,0054)	O	universal (Null)	-	no
Number of Study related Series	(0020,1206)	O	universal (Null)	-	yes[1]
Number of Study related Instances	(0020,1208)	O	universal (Null)	-	no
Series Level					
Series Instance UID	(0020,000E)	U	universal (Null)		no
Series Number	(0020,0011)	R	universal (Null)	-	yes
Modality	(0008,0060)	R	universal (Null)	-	yes
Series Description	(0008,103E)	O	universal (Null)	-	yes
Body Part Examined	(0018,0015)	O	universal (Null)	-	yes
Performing Physician	(0008,1050)	O	universal (Null)	-	yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	yes
Retrieve AE	(0008,0054)	O	universal	-	yes

Attribute name	Tag	Type	Matching	User Input	Return Value Display
Title			(Null)		
Protocol Name	(0018,1030)	O	universal (Null)	-	no
Perf. Procedure Step Start Date	(0040,0244)	O	universal (Null)	-	yes
Perf. Procedure Step Start Time	(0040,0245)	O	universal (Null)	-	yes
Requested Attribute Sequence	(0040,0275)	O	universal (Null)	-	yes
> Requested Procedure ID	(0040,1001)	O	universal (Null)	-	yes
> Scheduled Procedure ID	(0040,0009)	O	universal (Null)	-	yes
Number of Series related Instances	(0020,1209)	O	universal (Null)	-	yes
Image Level					
SOP Instance UID	(0008,0018)	U	single value	-	No
Image Number	(0020,0013)	R	universal (Null)	-	Yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	No
Retrieve AE Title	(0008,0054)	O	universal (Null)	-	No
Instance Date	(0008,0023)	O	universal (Null)	-	No
Instance Time	(0008,0033)	O	universal (Null)	-	No
Number of Frames	(0028,0008)	O	universal (Null)	-	yes
Content Date	(0008,0023)	O	single value, range matching, universal	-	Yes

Attribute name	Tag	Type	Matching	User Input	Return Value Display
Content Time	(0008,0033)	O	single value, range matching, universal	-	Yes
Referenced Request Sequence	(0040,A370)	O	sequence matching	-	Yes
>Accession Number	0008,0050)	O	single value, universal	-	Yes
>Requested Procedure ID	(0040,1000)	O	single value, universal	-	Yes
Concept Name Code Sequence	(0040,A043)	O	sequence matching	-	Yes
>Code Value	(0008,0100)	O	single value, universal, wildcard	-	Yes
>Coding Scheme Designator	(0008,0102)	O	single value, universal, wildcard	-	Yes
>Coding Scheme Version	(0008,0103)	O	single value, universal, wildcard	-	Yes
>Code Meaning	(0008,0104)	O	single value, universal, wildcard	-	Yes
Template Identifier	(0040,DB00)	O	single value, universal, wildcard	-	Yes
Completion Flag	(0040,A491)	O	single value, universal, wildcard	-	Yes
Verification Flag	(0040,A493)	O	single value, universal, wildcard	-	Yes
Verifying Observer Sequence	(0040,A073)	O	sequence matching	-	Yes
>Verifying Organization	(0040,A027)	O	single value, universal, wildcard	-	Yes

Attribute name	Tag	Type	Matching	User Input	Return Value Display
>Verifying DateTime	(0040,A030)	O	single value, range matching, universal	-	Yes
>Verifying Observer Name	(0040,A075)	O	single value, universal, wildcard	-	Yes
>Verifying Observer Identification Code Sequence	(0040,A088)	O	sequence matching	-	Yes
>>Code Value	(0008,0100)	O	single value, universal, wildcard	-	Yes
>>Coding Scheme Designator	(0008,0102)	O	single value, universal, wildcard	-	Yes
>>Coding Scheme Version	(0008,0103)	O	single value, universal, wildcard	-	Yes
>>Code Meaning	(0008,0104)	O	single value, universal, wildcard	-	yes

The Find SCU interprets following status codes:

Table 1: C-FIND response status

Service Status	**Meaning**	**Protocol Codes**	**Related Fields**
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current	FF00	Identifier

	Match is supplied and any Optional Keys were supported in the same manner as Required Keys		
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

7.1.2.2 Real-World Activity – Move SCU

7.1.2.2.1 Associated Real-World Activity – Move SCU "Import"

When selecting a data entry in the Query UI and activate the "Import" function, a retrieval request is passed to the archival application which issues a C-MOVE service according to the Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The possibility to request the remote C-MOVE provider (remote application that responded to the C-FIND) to move data to an application entity other than the C-MOVE SCU (the *syngo.four*Sight Workplace application) is NOT USED.

C-MOVE operation on Patient Level is not supported by the Query UI.

7.1.2.2.2 Proposed Presentation Contexts – Move SCU "Import"

The *syngo.four*Sight Workplace application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Note: C-MOVE extended negotiation will not be supported by the SCU

7.1.2.2.3 SOP Specific Conformance Statement – Move SCU "import"

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations must be done on a different association to transfer images to the own Storage Service Class SCP.

The Move SCU interprets following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	CXXX	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures or Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

8 Communication Profiles

8.1 Supported Communication Stacks

The *syngo.four*Sight Workplace DICOM application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard. The product target Operating System is Microsoft Windows XP Professional SP2 (32 bit).

8.1.1 TCP/IP Stack

The *syngo.four*Sight Workplace application uses the TCP/IP stack from the target operating system upon which it executes.

8.1.1.1 API

The *syngo.four*Sight Workplace application uses the DCMTK library release 3.5.2 that is based on a TCP/IP socket interface.

8.1.1.2 Physical Media Support

The *syngo.four*Sight Workplace application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the target operating system upon which it executes.

9 Information Object Implementation

This section specifies the subsets of DICOM Information Object Definitions (IOD) used to represent the information objects produced by this implementation.

9.1 US Image Storage IOD

This section describes the US Image Storage IODs which are created by this implementation when the user activates the “Store” function.

9.1.1 US Image Storage IOD Modules

IE	Module	Usage	Reference
Patient	Patient	M Usage: Used	9.1.2.1
Study	General Study	M Usage: Used	9.1.2.2
	Patient Study	U Usage: Not used	Never sent
Series	General Series	M Usage: Used	9.1.2.3
Equipment	General Equipment	M Usage: Used	9.1.2.4
Image	General Image	M Usage: Used	9.1.2.5
	Image Pixel	M Usage: Used	9.1.2.6
	Modality LUT	U Usage: Not used	Never sent
	VOI LUT	U Usage: Not used	Never sent
	SOP Common	M Usage: Used	9.1.2.7

9.1.2 US Image Storage Module Descriptions

9.1.2.1 Patient Module

Attribute Name	Tag	Type	VR	VM
Patient's Name	(0010, 0010)	2	PN	1
Patient ID	(0010, 0020)	2	LO	1
Patient's Birth Date	(0010, 0030)	2	DA	1
Patient's Sex	(0010, 0040)	2	CS	1

9.1.2.2 General Study Module

Attribute Name	Tag	Type	VR	VM
Study Instance UID	(0020, 000D)	1	UI	1
Study Date	(0008, 0020)	2	DA	1
Study Time	(0008, 0030)	2	TM	1
Study ID	(0020, 0010)	2	SH	1
Accession Number	(0008, 0050)	2	SH	1
Study Description	(0008, 1030)	3	LO	1

9.1.2.3 General Series Module

Attribute Name	Tag	Type	VR	VM
Modality	(0008, 0060)	1	CS	1
Series Instance UID	(0020, 000E)	1	UI	1
Series Number	(0020, 0011)	2	IS	1

9.1.2.4 General Equipment Module

Attribute Name	Tag	Type	VR	VM
Manufacturer	(0008,0070)	3	CS	1
Manufacturer's Model Name	(0008,1090)	3	CS	1
Device Serial Number	(0018,1000)	3	LO	1
Software Versions	(0018,1020)	3	LO	1-n

9.1.2.5 General Image Module

Attribute Name	Tag	Type	VR	VM
Instance Number	(0020, 0013)	2	IS	1
Patient Orientation	(0020, 0020)	2c	CS	2
Content Date	(0008, 0023)	2c	DA	1
Content Time	(0008, 0033)	2c	TM	1
Acquisition Date	(0008, 0022)	3	DA	1
Acquisition Time	(0008, 0032)	3	TM	1
Image Date	(0008, 0023)	2cc	DA	1
Image Time	(0008, 0033)	2c	TM	1

9.1.2.6 Image Pixel Module

Attribute Name	Tag	Type	VR	VM
Samples per Pixel	(0028, 0002)	1	US	1
Photometric Interpretation	(0028, 0004)	1	CS	1
Rows	(0028, 0010)	1	US	1
Columns	(0028, 0011)	1	US	1
Bits Allocated	(0028, 0100)	1	US	1
Bits Stored	(0028, 0101)	1	US	1
High Bit	(0028, 0102)	1	US	1
Pixel Representation	(0028, 0103)	1	US	1
Pixel Data	(7FE0, 0010)	1	OW/OB	1
Planar Configuration	(0028, 0006)	1c	US	1
Pixel Aspect Ratio	(0028, 0034)	1c	IS	2

9.1.2.7 SOP Common Module

Attribute Name	Tag	Type	VR	VM
SOP Class UID	(0008, 0016)	1	UI	1
SOP Instance UID	(0008, 0018)	1	UI	1

9.1.2.8 US Region Calibration Module Attributes

Attribute Name	Tag	Type	VR	VM
Sequence of Ultrasound Regions	(0018, 6011)	1	SQ	1
> Region Location Min x0	(0018, 6018)	1	UL	1
> Region Location Min y0	(0018, 601A)	1	UL	1
> Region Location Min x1	(0018, 601C)	1	UL	1
> Region Location Min y1	(0018, 601E)	1	UL	1
> Physical Units X Direction	(0018, 6024)	1	US	1
> Physical Units Y Direction	(0018, 6026)	1	US	1
> Physical Delta X	(0018, 602C)	1	FD	1
> Physical Delta Y	(0018, 602E)	1	FD	1
> Region Spatial Format	(0018, 6012)	1	US	1
> Region Data Type	(0018, 6014)	1	US	1
> Region Flags	(0018, 6016)	1	UL	1

List of Figures

Figure 1: Application Data Flow Diagram - Verification SCU 8
Figure 2: Application Data Flow Diagram - Storage SCU 12
Figure 3: *syngo.four*Sight Workplace Application Data Flow Diagram - Query/Retrieve SCU21

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List of Tables

Table 1: C-FIND response status 29